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**When the Vacuum is a Drag** ANDREW SYKES, MATTHEW DAVIS, Australian Center for Quantum-Atom optics, University of Queensland, QLD 4072, Australia, DAVID ROBERTS, Center for Nonlinear Studies, Los Alamos National Laboratory, NM — Superfluidity is a remarkable macroscopic quantum phenomenon that was discovered in 1938 in liquid helium below 2.17 K by Kapitza, Allen and Misener. London was the first person to make the connection with the theory of Bose-Einstein condensation (BEC) and degenerate Bose gases developed by Einstein in 1924, and BEC is now understood to be an important ingredient of superfluidity. One of the features of a superfluid is that it exhibits frictionless flow below a certain "critical" velocity, and this is well understood at the level of mean-field theory. However, the inclusion of quantum fluctuations gives rise to a puzzle that has a connection to the Casimir force between two dielectrics in vacuum. Calculations suggest that the scattering of quantum fluctuations lead to a non-zero drag force at any velocity. Here I will discuss our recent work on calculating the drag force on an obstacle moving through a 1D Bose gas.

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